CANTERBURY STREET, GILLINGHAM

PHASE II SITE INVESTIGATION

JANUARY 2010

REPORT REF: 1000/SO/01-10/002

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1.0 INTRODUCTION

1.1 This Phase II Site Investigation for the former Municipal Buildings off Canterbury Street, Gillingham has been prepared by Lustre Consulting for the benefit of Charing Care Limited. Charing Care Limited have received planning permission to convert the former Municipal Buildings into a 24 bed care home with associated car parking and limited soft landscaping. Due to the historic use as Gillingham Hospital during the early 1900's the Local Planning Officer (LPO) at Medway Council requires an assessment for the potential of land contamination.

1.2 The first stage of the assessment comprised a Phase I Environmental Risk Assessment (ERA), prepared by Millard Consulting in February 2009 to support the planning application (Ref.1). The Phase I ERA identified limited potential sources of contamination generally associated with the historic use, bulk fuel tank within the boiler room and suspected asbestos containing materials (ACMs). Moderate / low to high risks were subsequently assessed to future end users and renovation workers. Based on these findings, the LPO inserted planning conditions (Conditions 2 to 5) into the planning permission requesting further assessment of the identified risks in the form of a Phase II Site Investigation. This report therefore forms the second stage of the phased assessment.

Objectives

1.3 To summarise, the objective of the site investigation was to:

- Investigate the condition of the shallow soils within the area of proposed soft landscaping at the site to assess the presence, likely extent and nature of any soil contamination as a result of the historic site use.

- Assess the effect that the identified soil conditions will have on future redevelopment by comparing the chemical test results against firstly generic threshold values for human health and secondly, site specific threshold values derived in a quantitative risk assessment, if required.

- Assess the environmental risks by developing a conceptual model and undertaking a detailed qualitative risk assessment using the approved contaminant source – pathway – receptor methodology.

- Identify any environmental liabilities associated with the redevelopment of the site, identify the implications to future proposed development, renovation workers and surrounding environment and provide recommendations, if any, to further clarify, manage and mitigate any environmental risks identified at the site.

1.4 The report has been prepared using published information and information provided by the Client which was made available at the time of writing only. No liability is extended to any information which has become available since this time. Third parties using information contained in this report do so at their own risk.

Land Quality Assessment Methodology

1.5 Environmental regulators use the "source-pathway-target pollution linkage" concept when assessing the risk posed by a contaminated site and for a liability to arise each stage of the pollution linkage must be present. If there is no pollution linkage, no risk exists. However, if a pollution linkage is established, the assessment will then consider the level of risk and whether any further works or actions are required to clarify, manage or mitigate the risk. The method of assessment is in accordance with available guidance from the Department of the Environment, Transport and the Regions (DETR) Statutory Guidance on Contaminated Land (Ref. 2) and Model Procedures (CLR11) produced by the Department for Environment, Food & Rural Affairs (DEFRA) and the Environment Agency (EA) (Ref. 3).

1.6 References to the word “contamination” in this report relate to the statutory definition of contaminated land under the Environmental Protection Act 1990: Part IIA Contaminated Land Statutory Guidance: Edition 2, May 2006 unless otherwise stated.

1.7 That definition is: “*any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances on in or under the land that –*

a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

b) Significant pollution of water environment is being caused or there is significant possibility of such pollution being caused”.

Report Structure

1.8 Chapter 2 summarises the site investigation strategy, method of investigation and testing. Chapter 3 provides an interpretation of the field results. Chapter 4 provides an interpretation of the chemical analysis and compares the test results against published guideline values for soil samples. The conceptual model and qualitative risk assessment are summarised in Chapter 5 and the conclusions are set out in Chapter 6. The implications of the investigation and recommendations are set out in Chapter 7. The report references are listed in Chapter 8.

2.0 INVESTIGATION METHODOLOGY

Initial Conceptual Model

2.1 The initial conceptual model developed in the Phase I ERA (Ref.1) identified a limited number of potential pollution linkages generally associated with the historic site use, as summarised in Table 1.

Table 1: Initial Conceptual Model (Sources – Pathways – Receptors)

Sources	Pathways	Receptors
Historic hospital from 1890s to 1930s Former above ground fuel tank within boiler room Suspected asbestos containing materials (ACMs)	Direct contact and ingestion of contaminated soils Inhalation of contaminated dust Inhalation of asbestos fibres	Future end users comprising care home residents, visitors and workers Renovation workers

Summary of Significant Risks

2.2 Following the identification of the above potential pollutant linkages, the risks posed to future end users (including care home residents, visitors and workers) were assessed as moderate / low to moderate. The most significant pollutant linkage is considered to be the historic hospital reflecting the uncertainties associated with the storage and waste disposal activities undertaken during this time and the potential for impacted soil to be present as a result. Notwithstanding this however, the potential for direct contact is likely to be limited due to the nature of the site (covered mostly by hardstanding) and the proposed use. The risks posed by suspected ACMs will be lowered to acceptably low levels through the removal of all ACMs prior to the commencement of the renovation works.

2.3 The risks posed to renovation workers were assessed as moderate / low to high generally reflecting the likely direct contact with soils and suspected ACMs during the renovation works but also the severity of the suspected ACMs. These risks however, will be lowered to acceptably low levels through the use of specialist contractors, appropriate personal protective equipment (PPE) and an awareness of the risks through regular ‘toolbox’ talks.

Investigation Sampling Strategy

2.4 The investigation sampling strategy was therefore designed in accordance with recommendations included within the Phase I ERA (Ref. 1). The site investigation, which

comprised sampling of proposed soft landscaping areas, was undertaken on Tuesday 12th January 2010 under the supervision of a qualified consultant employed by Lustre Consulting. The site investigation was carried out with due regard to existing standards and guidelines including BS10175: 2001 (Ref. 4) and BS5930: 1999 (Ref. 5).

2.5 A sample location plan showing all exploratory locations is shown in Drawing 1000/002. A copy of the investigation logs are enclosed in Appendix A and a photographic record of the investigation is shown in Appendix B.

Window Sample Boreholes

2.6 A total of five window sample boreholes were drilled up to a maximum depth of 2.0m below ground level (bgl) through the hardstanding, made ground and into the underlying natural soils. The window sample boreholes, drilled with a tracked terrier rig, were distributed across the area of proposed soft landscaping (at the entrance and rear of the site). The exception to this was BH1, which was excavated using a hand auger to a depth of 1.0m bgl due to the presence of underground services. At each location, the ground conditions were visually assessed and logged with soil samples recovered for chemical analysis. All boreholes were backfilled with arisings upon completion.

Soil Sampling

2.7 All soil arisings were inspected for visual and olfactory evidence of contamination. Each borehole was logged with samples collected and scheduled by Lustre Consulting for a range of chemical testing. All soil sampling containers were filled with as much sample as possible with any large stones or cobbles removed to minimise the potential for unreliable analytical data returns and to increase the volume of soil that was able to be analysed.

2.8 The soil samples were deposited in clean glass amber jars and plastic tubs which were provided by a UKAS (United Kingdom Accreditation Service) accredited laboratory. All sample containers were appropriately labelled with their location and depth and packed into cold cool boxes with ice or frozen ice packs. At the end of the day the cool boxes were sent with chain of custody documentation by courier to the laboratory.

Analytical Suite

2.9 A total of 14 soil samples were recovered during the investigation, ten of which were selected for a range of inorganic and organic chemical analysis. The chemical analysis was undertaken by Chemtest at their UKAS (United Kingdom Accreditation Service) (ISO 17025) accredited laboratory in Newmarket. The soil samples were managed by Chemtest in accordance with the Environment Agency's MCERTS performance standard whilst in custody with the laboratory (Ref. 6).

2.10 A total of ten soil samples, five from the made ground and five from the underlying natural ground, were analysed for the following determinands:

- Metals: arsenic, cadmium, chromium, mercury, lead, nickel, selenium, water soluble boron, copper and zinc.
- Water soluble sulphate (as SO4), pH.
- Total cyanide, total phenols.
- Polycyclic Aromatic Hydrocarbons (PAHs) (total and targeted speciated US EPA priority 16 compounds including benzo(a)pyrene).
- Total petroleum hydrocarbons (TPH) as Extractable Petroleum Hydrocarbons (EPH) (C10-C40).
- Total Organic Carbon (TOC).
- Asbestos screen (soils only).

2.11 The results of the chemical analysis are reported in Chapter 4 and included in Appendix C.

3.0 INTERPRETATION OF FIELD DATA

Introduction

3.1 This chapter collates all the factual information from the investigation and provides a summary of the ground conditions encountered during the intrusive works. A copy of the investigation logs are enclosed in Appendix A and a photographic record is included in Appendix B.

Ground Conditions

3.2 With the exception of one location (BH1), a thin layer of concrete and asphalt mix was encountered across the site ranging in thickness of between 0.1m bgl (at BH2 and BH4) and 0.2m bgl (at BH5). Underlying the concrete / asphalt and grass at BH1, a layer of made ground generally comprising black / grey / brown gravelly sand with fragments of brick, concrete and occasional asphalt was encountered. The gravels comprised fine to coarse sub-angular to sub-rounded flint. At BH4 and BH5 however, pockets of black ashy gravelly rubble with frequent fine to medium gravels of clinker was recorded. The made ground was proven to a depth ranging between 0.5m (BH4) and 0.65m (BH1) bgl.

3.3 Underlying the made ground, a layer of firm to stiff orange / brown slightly gravelly clay was encountered with very occasional fine to medium sub-angular to rounded flint and chalk. The clay, considered to be drift deposits, was proven to a maximum depth of 0.95m bgl. Underlying the clay at each location was the Upper Chalk comprising soft white gravelly clayey chalk with frequent fine to coarse sub-angular to angular gravels of flint and occasional cobbles of flint. The chalk was proven to a maximum depth of 2.0m bgl.

Visual Evidence of Contamination

3.4 With the exception of the pockets of ashy clinker encountered at BH4 and BH5 there was no visual or olfactory evidence of contamination observed during the investigation.

Groundwater

3.5 Groundwater was not encountered during the investigation.

4.0 INTERPRETATION OF CHEMICAL ANALYSIS

Introduction

4.1 The interpretation of the chemical analysis carried out on soil samples recovered during the investigation is set out in the following chapter. The chemical test certificates are enclosed in Appendix C.

Assessment Criteria

4.2 In order to put the analytical test results into context, the chemical data from the soil sample analysis have been assessed against several sets of guidelines in order to evaluate the risks. This is a Tier 1 assessment with data interpreted against generic assessment criteria, which have been derived and published by an authoritative body and are designed to be protective under a range of environmental conditions. The following paragraphs provide a brief description of the generic assessment criteria used in the interpretation of the chemical analysis for this assessment:

Contaminated Land Exposure Assessment (CLEA) Model

4.3 The publication of the UK's CLEA (Contaminated Land Exposure Assessment) model by the Environment Agency in March 2008 (Ref. 7) replaced the ICRCL guidelines with a set of Soil Guideline Values (SGVs) based on published Contaminated Land Reports (CLR) documents and toxicological reports from the Environment Agency. The SGVs provide a means of evaluating chronic risks to human health from contaminants via different pathways for a range of land uses. To date, SGVs have been set for a limited number of contaminants and developed for the following land uses:

- Residential use with plant uptake (and allotments)
- Residential use without plant uptake
- Industrial/ commercial use

4.4 These SGVs (and the toxicological data used to derive them) however have since been withdrawn by DEFRA while up-to-date guidelines are provided. To date, an updated CLEA

model (CLEA 1.06) (Ref. 7) has been published, the CLR documents have been replaced with revised Special Report (SR) documents and several new SGVs have been published. The new SGVs have been derived using CLEA 1.04 in line with the SR documents for a residential end use, allotments and industrial / commercial. Notwithstanding this however, there are many contaminants for which new SGVs are still not available. Therefore, in the absence of SGVs, other available screening values (such as LQM CIEH values) have been used (as detailed below). This is a Tier 1 assessment however, should the need for a Site Specific Assessment using Site Specific Assessment Criteria (SSAC) be realised as part of the Tier 1 assessment, the CLEA 1.06 model will be used to undertake a Tier 2 assessment.

4.5 Future redevelopment of the site is to comprise a residential care home comprising a 24 bed home with car parking and limited soft landscaping. It is considered that the consumption of home-grown vegetables at the site is unlikely reflecting the nature of the proposed soft landscaping and the elderly nature of the future residents. However, the newly published SGVs now comprise of guidelines for a residential end use including private gardens that may be used to grow vegetables. This is considered to be conservative for this site but also the most appropriate land use for assessing the risks posed to future occupiers. Where exceedances above these SGVs are identified however, consideration will be given to the derivation of a site specific assessment criteria (SSAC) using CLEA 1.06 model.

LQM CIEH GAC

4.6 Following the withdrawal of the previous SGVs and in the absence of replacement SGVs for a number of commonly encountered contaminants, the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management (LQM) sponsored a second workshop in January 2009 with the objective of deriving a new set of Generic Assessment Criteria (GAC) for selected contaminants of concern. In July 2009, LQM published a report listing the LQM CIEH GAC for 35 contaminants including full details of how each GAC was arrived at and the input parameters used (Ref. 8). The GAC were derived in line with the revised SR documents using the CLEA 1.06 model and as such are based on the conceptual model that underpins the Soil Guideline Values.

Soil Analysis

4.7 This Phase II site investigation comprised a limited intrusive investigation targeting areas of proposed soft landscaping. No ‘point’ sources of contamination were targeted during the investigation and as such the chemical analysis results has been assessed as one data set (split into made ground and natural ground) in accordance with CIEH and CL:AIRE statistical

guidance published in May 2008 (Ref 9). Table 2 summarises the results of samples recovered from the made ground whilst Table 3 summarises the results of samples recovered from the underlying naturel soils.

Made Ground Assessment

4.8 A total of five samples, recovered from the shallow made ground, were tested for a standard chemical analysis suite (including heavy metals, TOC, TPH and speciated PAHs), as summarised below.

Table 2: Made Ground Test Results

Determinand	Units	Number of Samples	SGV residential with plant uptake (Exceeded)	Min. Conc.	Max. Conc.	Location of Max Conc.
Inorganics						
Arsenic	mg/kg	5	32 (0)	11	24	BH1(0.35m) BH2 (0.2m)
Cadmium	mg/kg	5	10 (0)	0.29	1.5	BH3 (0.3m)
Chromium	mg/kg	5	3000 (0)	9.4	35	BH5 (0.4-0.5m)
Lead	mg/kg	5	450 (0)	9.1	260	BH1 (0.35m)
Mercury	mg/kg	5	170 (0)	<0.1	0.57	BH1 (0.35m)
Nickel	mg/kg	5	130 (0)	6.7	33	BH5 (0.4-0.5m)
Selenium	mg/kg	5	350 (0)	<0.2	<0.2	-
Boron	mg/kg	5	291± (0)	<0.4	1.5	BH5 (0.4-0.5m)
Copper	mg/kg	5	2330± (0)	<5.0	45	BH1 (0.35m)
Zinc	mg/kg	5	3750± (0)	19	200	BH3 (0.3m)
pH	-	5	-	8.1	9.0	BH2 (0.2m)
Total Cyanide	mg/kg	5	50^ (0)	<0.5	2.1	BH1 (0.35m)
Water Soluble Sulphate	mg/kg	5	-	0.03	0.20	BH5 (0.4-0.5m)
Organics						
Total Organic Carbon	%	5	-	0.29	2.4	BH1 (0.35m)
Phenol	mg/kg	5	210 (0)	<0.3	<0.3	-
Extractable Petroleum Hydrocarbons						
EPH (C10-C40)	mg/kg	5	150† **(1)**	<10.0	450	BH3 (0.3m)
Speciated Polyaromatic Hydrocarbons						
Benzo(a)pyrene	mg/kg	5	0.83± **(2)**	<0.1	7.1	BH2 (0.2m)
Dibenzo(ah)anthracene	mg/kg	5	0.76± **(1)**	<0.1	1.7	BH2 (0.2m)
Naphthalene	mg/kg	5	1.5± (0)	<0.1	0.18	BH1 (0.35m) BH2 (0.2m)
Total PAHs (16 USEPA priority pollutants)	mg/kg	5	40^ **(1)**	<2.0	68	BH2 (0.2m)

All Units mg/kg except pH (pH units) and Sulphate (g/l);
Based on 1.0% SOM
^ DIV Dutch Intervention Values used for screening the concentrations only
± LQM CIEH GAC are used for screening the concentrations only;

† Internal Screening Value

4.9 All concentrations of inorganic determinands were found to be low and below respective guideline values for a residential end use. The soil pH value for samples recovered across the site was found to range between 8.1 and 9.0, indicating slightly alkaline conditions.

4.10 Concentrations of total cyanide were found to be low and mostly below laboratory detection limits.

4.11 The percentage of total organic carbon (TOC) is measured to determine the amount of naturally occurring organic matter that may be present within the soil. The TOC ranged between 0.29% and 2.4% which is equivalent to a Soil Organic Matter (SOM) fraction of between 0.5% and 4.1%. An average TOC of 1.0% (1.8% SOM) was calculated. The threshold values applied for the assessment of organic determinands within the made ground will therefore be based on 1.0% SOM as this is the closest and more conservative value.

4.12 Concentrations of total phenols were found to be low and generally below laboratory detection limits in the five samples analysed.

4.13 With the exception of one sample (recovered from BH3), all samples recorded concentrations of extractable petroleum hydrocarbons (EPH) that were low and below the internal screening value of 150mg/kg. At BH3 (at a depth of 0.3m) however, an EPH concentration of 450mg/kg was detected, exceeding the screening value by a factor of 3. There was no visual or olfactory evidence of contamination recorded at this location during the investigation and no identified source. In accordance with CIEH and CL:AIRE statistical guidance and based on these observations, this concentration cannot be assessed as an outlier. The mean concentration of EPH has therefore been calculated as 101mg/kg, which is below the conservative internal screening of 150mg/kg.

4.14 With the exception of one sample (recovered from BH2), all total PAH concentrations (sum of the US Environmental Protection Agency (EPA) 16 priority PAH pollutants) were found to be low and below the DIV. At BH2 (at a depth of 0.2m) however, a concentration of 68mg/kg was detected, slightly elevated above the DIV. Further analysis in the form of speciated PAHs including benzo(a)pyrene (considered to be the toxic driver in PAH assessment) was also undertaken to provide more information on the type of PAHs present. Two samples, recovered from BH1 and BH2, recorded elevated concentrations of benzo(a)pyrene above the screening value for a residential end use. The elevated concentrations, exceeding the screening value by factors of 2.3 and 8.0 respectively, were detected within the shallow soils.

There was no visual evidence of contamination at these locations and due to the fact that the made ground were generally homogenous across the site and a specific source for these elevated concentrations cannot be determined, the elevated concentrations cannot be confirmed as outliers. The mean concentration across the site is therefore calculated as 1.9mg/kg, which also exceeds the screening value of 0.83mg/kg for a residential use.

4.15 As stated in paragraph 4.5, the screening value of 0.83mg/kg includes the potential pathway of consumption of home-grown vegetables. Taking into account the nature of the future users and proposed soft landscaping, the consumption of home-grown vegetables is not considered to be a significant pathway. A SSAC for a residential end use without consumption of home-grown vegetables has therefore been derived using CLEA model 1.06 for comparison purposes. Using the site specific pH and TOC value, the SSAC was calculated as 1.04mg/kg. The mean benzo(a)pyrene concentration however, is still slightly elevated above this value.

Natural Ground Assessment

4.16 A total of five samples were recovered from the natural soils including the clayey drift deposits and underlying chalk. The samples were tested for a standard chemical analysis suite (including heavy metals, TOC, TPH and speciated PAHs).

Table 3: Natural Ground Test Results

Determinand	Units	Number of Samples	SGV residential with plant uptake (Exceeded)	Min. Conc.	Max. Conc.	Location of Max Conc.
Inorganics						
Arsenic	mg/kg	5	32 (0)	9.9	18	BH1(0.75m)
Cadmium	mg/kg	5	10 (0)	0.14	0.39	BH1(0.75m)
Chromium	mg/kg	5	3000 (0)	<5.0	44	BH2(0.6-0.8m)
Lead	mg/kg	5	450 (0)	<5.0	48	BH1(0.75m)
Mercury	mg/kg	5	170 (0)	<0.10	0.22	BH1(0.75m)
Nickel	mg/kg	5	130 (0)	<0.5	36	BH2(0.6-0.8m)
Selenium	mg/kg	5	350 (0)	<0.2	<0.2	-
Boron	mg/kg	5	291± (0)	<0.4	1.2	BH2(0.6-0.8m)
Copper	mg/kg	5	2330± (0)	<5.0	15	BH1(0.75m)
Zinc	mg/kg	5	3750± (0)	<10	63	BH2(0.6-0.8m)
pH	-	5	-	7.6	9.0	BH4(1.0-1.2m)
Total Cyanide	mg/kg	5	50^ (0)	<0.5	0.7	BH1(0.75m)
Water Soluble Sulphate	mg/kg	5	-	0.03	0.08	BH2(0.6-0.8m)
Organics						
Total Organic Carbon	%	5	-	<0.2	0.56	BH1(0.75m)

Determinand	Units	Number of Samples	SGV residential with plant uptake (Exceeded)	Min. Conc.	Max. Conc.	Location of Max Conc.
Phenol	mg/kg	5	210 (0)	<0.3	<0.3	-
Extractable Petroleum Hydrocarbons						
EPH (C10-C40)	mg/kg	5	150† (0)	<10.0	<10.0	-
Speciated Polyaromatic Hydrocarbons						
Benzo(a)pyrene	mg/kg	5	0.83± (0)	<0.1	0.5	BH1(0.75m)
Dibenzo(ah)anthracene	mg/kg	5	0.76± (0)	<0.1	0.1	BH1(0.75m)
Naphthalene	mg/kg	5	1.5± (0)	<0.1	<0.1	-
Total PAHs (16 USEPA priority pollutants)	mg/kg	5	40^ (0)	<2.0	5.5	BH1(0.75m)

All Units mg/kg except pH (pH units) and Sulphate (g/l);
Based on 1.0% SOM
^ DIV Dutch Intervention Values used for screening the concentrations only
± LQM CIEH GAC are used for screening the concentrations only;
† Internal Screening Value

4.17 All samples recorded concentrations that are low and below the respective guideline values. No exceedances above the respective guideline values for a residential end use were detected.

5.0 CONCEPTUAL MODEL & RISK ASSESSMENT

Introduction

5.1 This section assesses the significance of the environmental hazards identified at the site. This is achieved by developing a conceptual model for the site and undertaking a qualitative risk assessment.

5.2 In the UK, a conceptual model is formulated by identifying the contaminant sources, pathways and receptors relating to the site. If a pollution linkage is established between the contaminant sources and identified receptors, the assessment will then go on to consider the potential for pollution to occur by completing a qualitative risk assessment using a simple risk classification tool (Ref. 10). The outcome of the risk assessment will then be used to determine whether any further works or remediation is required to clarify, manage or mitigate the potential risk.

5.3 The method of assessment is in accordance with available guidance from the Department of the Environment Transport and the Regions (DETR) Statutory Guidance on Contaminated Land (Ref. 2) and Model Procedures (CLR11) produced by the Department for Environment, Food & Rural Affairs (DEFRA) and the Environment Agency (EA) (Ref. 3).

Conceptual Model

5.4 Limited potential pollution linkages have been identified at the site, as listed below:

- Elevated PAHs (including benzo(a)pyrene) present within the shallow made ground. Two concentrations were found to exceed the screening value for a residential end use. The mean concentration also exceeds this screening value by a factor of 2.3. The elevated concentrations are considered to be associated with the made ground as no ‘point’ sources were identified. PAHs comprise organic contaminants that are commonly found in ash and semi-combustible materials such as wood and charcoal.

5.5 The receptors and possible pathways in relation to the identified potential source of contamination onsite are summarised below:

- Future end-users comprising long term (elderly) occupiers of the care home, visitors and care home workers. Possible direct contact with contaminated soils, accidental ingestion and inhalation of contaminated dust generated from soils within areas of soft landscaping. Presence of buildings and hardstanding across the rest of the site will act as a barrier between future site users and the underlying soils. Proposed soft landscaping limited to small areas at the site entrance and to the rear of the building.

- Construction workers during the renovation works. Possible direct contact with contaminated soils and accidental ingestion, inhalation of contaminated dust generated from soils. Groundwork's likely to be limited to landscaping and shallow excavations and footings from any new services.

- Groundwater (major aquifer) – Pollution of major aquifer from identified sources and leaching from contaminated soils. Downward and lateral migration through the soils. No drift deposits present over Upper Chalk.

- Existing and any future building structures and underground services. Chemical attack on underground services including drinking water pipes.

6.1 Surface water has not been considered further as a receptor reflecting the absence of surface water features within 1km of the site.

Risk Assessment

5.6 A qualitative risk assessment has been formulated for the potential source-pathway-receptor linkages identified in the conceptual model. The risk assessment is based on the suggested approach set out in the available guidance (Ref. 10 and 11). The guidance uses a combination of the likelihood of a pollution event to occur taking account of the presence of a hazard (or source) and integrity of a pathway versus the consequence of a pollution occurrence, which is essentially a measure of the severity of a hazard to an identified receptor (such as a major aquifer or site end-user). The risk assessment methodology detailing the classes of significance is given in Appendix D.

Table 7: Qualitative Risk Assessment

Source	Pollutant	Pathway	Receptor	Likelihood of Occurrence	Consequence (severity)	Potential Risk
Made ground	Elevated benzo(a)pyrene concentrations (maximum of 7.1mg/kg at BH2). Mean concentration of 1.9mg/kg.	Direct contact and ingestion of contaminated soils, inhalation of contaminated dust generated from soils. Exposure to soils likely to be limited. Common garden activities unlikely due to nature of site and end users.	Future end users (care home residents, visitors and workers)	Unlikely	Medium	Low
		Direct contact and ingestion of contaminated soils. Inhalation of contaminated dust during renovation. Groundwork's likely to be limited to the removal of hardstanding and shallow soils and landscaping.	Renovation workers and landscapers	Low Likelihood	Medium	Moderate / Low [The use of personal protection equipment would lower the risk]
		Infiltration, through low permeable glacial deposits to sensitive groundwater/ aquifer. Nearest abstraction located >900m. PAHs are not very mobile. All concentrations in underlying natural soils are low.	Groundwater (major aquifer)	Unlikely	Mild	Very Low
		Future attack on any existing or new underground structures or services. PAHs not very mobile and only within shallow soils. All concentrations in underlying natural soils are low.	Drinking water pipes	Unlikely	Medium	Low

6.0 CONCLUSIONS

6.2 This Phase II site investigation has been undertaken at the former Municipal Buildings site off Canterbury Street to further assess the potential sources of contamination identified in the Phase I ERA and to determine any environmental liabilities associated with proposed redevelopment as a care home. The Phase I ERA identified moderate / low to high risks from the historic site use (as a hospital) and suspected ACMs. The Phase II site investigation was subsequently designed to allow further assessment of the nature of the ground conditions. The site investigation targeted the areas of proposed soft landscaping where the pollutant linkages were considered to be most significant.

6.3 The findings of the investigation have generally proven the majority of contaminants to be low and below the respective guidelines values for a residential use. The exception to this however, is slightly elevated hydrocarbons (comprising PAHs including benzo(a)pyrene) within the shallow soils. Due to the absence of visual and olfactory evidence of contamination recorded during the site investigation, it is our opinion that the contamination is associated with the made ground encountered directly underlying the concrete / asphalt. It is likely that the made ground, found to be comprise sandy brick and concrete rubble, is a result of the extensive historic use (since the late 1890s) and placement of fill and hardstanding over the years.

6.4 Despite this however, the identified contamination has been assessed as posing an acceptably low risk to future users of the care home (including residents, visitors and workers). This generally reflects the elderly nature of the future residents and as such the limited exposure to the soils. It is also our opinion that common garden activities (such as digging, planting and vegetable patches) will not be undertaken by future residents of the care home due to the nature of the soft landscaping (comprising aesthetic open communal space). The more commercial nature of the future visitors and workers has also been taken into account. Taking all of this into account, the likelihood of occurrence is considered to be unlikely and as such the risks are assessed as acceptably low.

6.5 Moderate / low risks have been assessed to future renovation workers at the site reflecting the likelihood of direct contact with the soils during the landscaping works. However, the use of appropriate personal protective equipment (PPE) and an awareness of the risk through regular ‘toolbox’ talks will lower the risk to acceptably low levels.

6.6 The moderate / low to high risks identified during the Phase I ERA (Ref. 1) from the suspected ACMs have not been considered further due to the removal of all ACMs by specialist contractors prior to the commencement of the renovation works. The pollutant linkages have therefore been broken through the removal of the source and no further assessment is required.

7.0 IMPLICATIONS AND RECOMMENDATIONS

7.1 Based on the findings of this Phase II Site Investigation it is our opinion that there are no significant pollutant linkages associated with the ground conditions at the site and that as a consequence of the landscaping works, the risks posed to future end users (already assessed as acceptably low) are unlikely to be realised.

7.2 Due to the presence of hardstanding across the areas of proposed soft landscaping in addition to the underlying made ground (comprising sandy rubble with brick and concrete fragments), it is likely that this shallow material will inevitably need to be removed from these areas for aesthetic and growth purposes. This would consequently break the pollutant linkage between the identified contamination and future residents of the care home by removing the shallow soils and PAH contamination. Suitable 'clean' topsoil would then be imported onto site and placed within the landscaped areas before the final landscaping is undertaken.

7.3 Despite the limited works required it should be noted that all imported topsoil will need to be proven to be suitable for use in residential gardens in line with current guidelines. It is therefore recommended that two samples are recovered from the source of topsoil (ideally prior to transportation onto site) in addition to one sample for every 500m^3 imported onto site. The samples will need to be tested for a standard suite of chemical analysis (including heavy metals, pH, EPH and PAHs). The Contaminated Land Officer at Medway Council will require copies of the test results for validation purposes.

7.4 Consideration will also need to be given to appropriate management of the excavated material. Taking into account the nature of the made ground (generally comprising sandy brick and concrete rubble), the level of contaminants detected and the low mobility of the contaminants it is our opinion that the material would be suitable for reuse as part of the construction works (as engineering fill under roads or hardstanding). However, should the material require off-site disposal, consideration will need to be given to some form of pre-treatment prior to disposal to a suitable landfill. Based on the chemical analysis and the nature of the made ground, it is likely to be classified as non-hazardous waste.

7.5 Finally, it is recommended that a copy of this Phase II Site Investigation is submitted to the Local Planning Authority at Medway Council for review and to ultimately work towards discharging the relevant planning conditions.

8.0 REFERENCES

1. Millard Consulting. Proposed development site, Municipal Buildings, Canterbury Street, Gillingham, Phase 1 Environmental Risk Assessment, February 2009, Ref: 10705/SO/02-09/2611.

2. Department of the Environment, Transport and the Regions. Circular 01/2006, Statutory Guidance on Contaminated Land. May 2006.

3. DEFRA/Environment Agency, Model Procedures for the Management of Land Contamination, CLR11, September 2004.

4. British Standard – Code of Practice Investigation of Potentially Contaminated Sites. BS 10175: 2001.

5. British Standard – Code of Practice for Site Investigation. BS 5930: 1999.

6. MCERTS Performance Standard for Laboratories Undertaking Chemical Testing of Soil v2, February 2003.

7. Environment Agency. Contaminated Land Exposure Assessment. Updated CLEA UK Software, CLEA V1.06, 2009

8. Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM), Generic Assessment Criteria for Human Health Risk Assessment, 2nd Edition, July 2009

9. Chartered Institute of Environmental Health and Contaminated Land Applications in Real Environments, Guidance on Comparing Soil Contamination Data with a Critical Concentration. May 2008

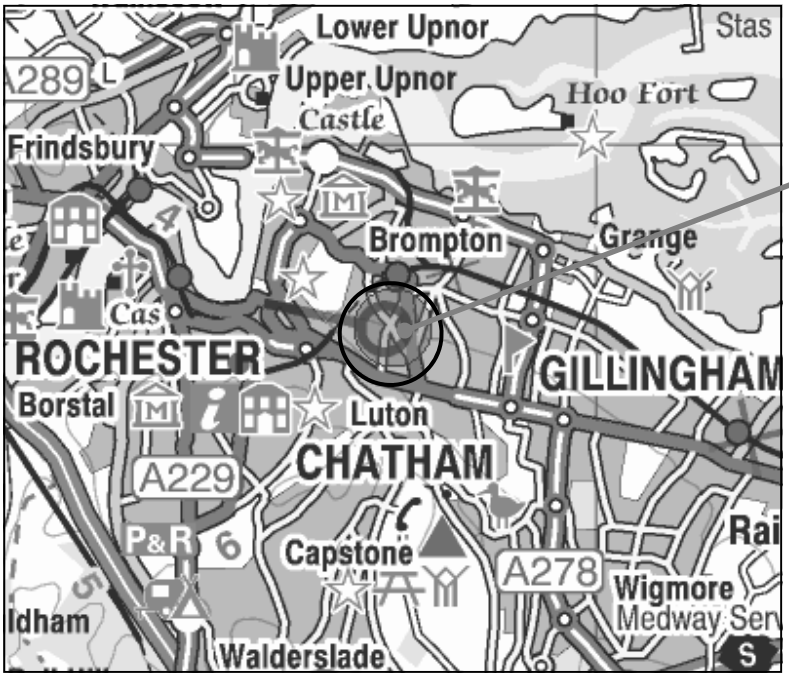
10. Construction Industry Research and Information Association (CIRIA). Contaminated Land Risk Assessment. A Guide to Good Practice. CIRIA C552 2001.

11. Department of the Environment, Transport and the Regions, Environment Agency and Institute of Environmental Health. Guidelines for Environmental Risk Assessment and Management. HMSO July 2000.

12. Environment Agency, Verification of Remediation of Contaminated Land, Draft Report, 2002.

DRAWINGS

SITE LOCATION PLAN



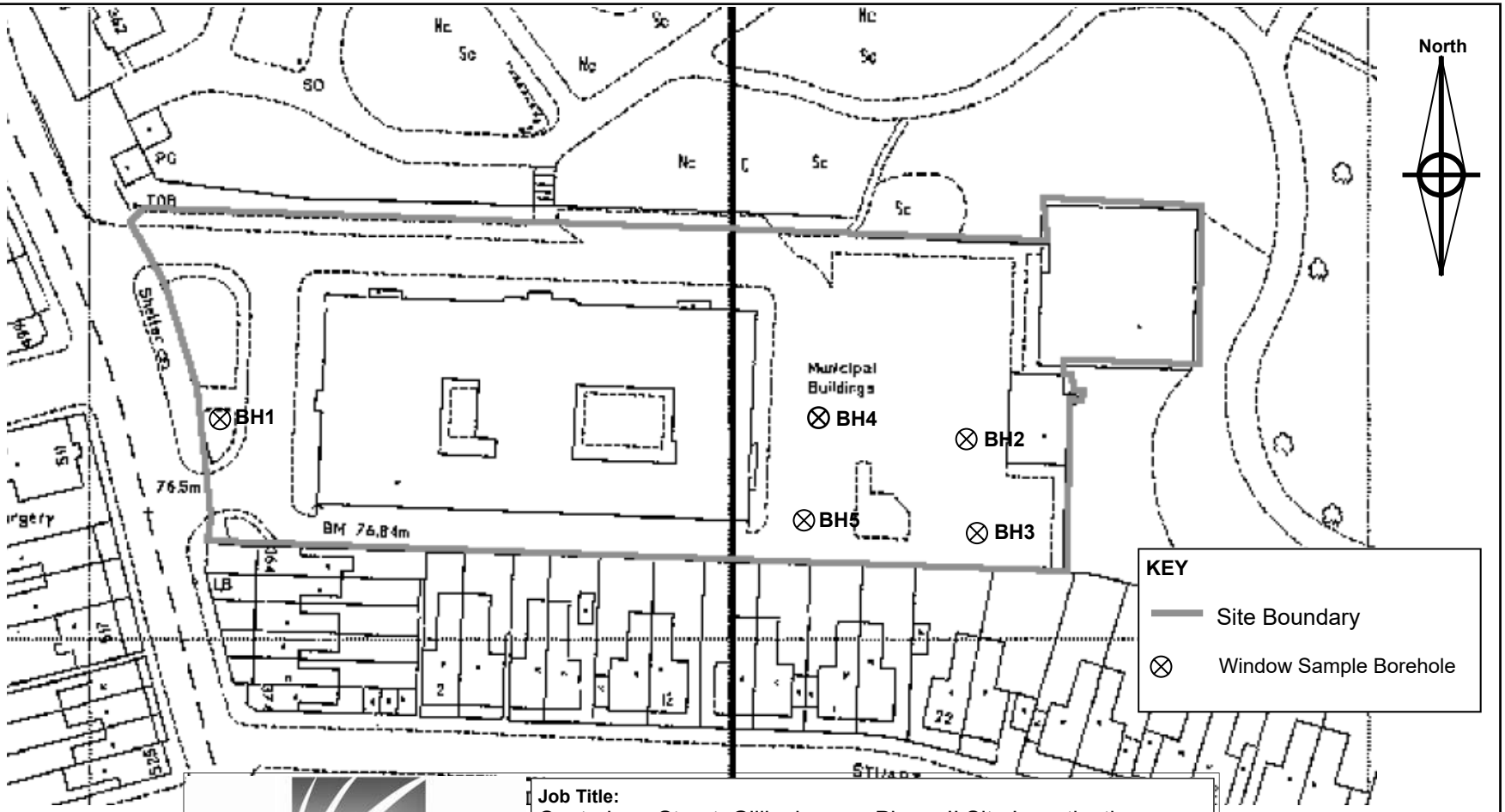
The Site

North

LUSTRE CONSULTING

Job Title: Canterbury Street, Gillingham — Phase II Site Investigation		
Drawing No. 1000-001	**Title** Site Location Plan	
Date January 2010	**Scale** NTS	**Drawn by** SO

SAMPLE LOCATION PLAN



LUSTRE CONSULTING

Job Title: Canterbury Street, Gillingham — Phase II Site Investigation		
Drawing No. 1000-002	**Title** Sample Location Plan	
Date January 2010	**Scale** NTS	**Drawn by** SO

APPENDICES

APPENDIX A

INVESTIGATION LOGS

LUSTRE CONSULTING	**Lustre Consulting Ltd**		Borehole No. **BH1**
Project Name: Canterbury Street, Gillingham	Project No. 1000	Co-ords: -	Date: 12/01/10
Project Type: Phase II Site Investigation		Dimensions: -	Scale: NTS
Client: Charing Care Limited			Logged By: SJO

Samples & In Situ Testing			Depth	Level	Legend	Stratum Description
Depth	Type	Results	(m)	(mAOD)		
0.35	D		0.32			Brown gravelly sand with occasional rootlets. Gravels are fine to medium brick, concrete and sub-angular to sub-rounded flint (MADE GROUND)
			0.65			Soft to firm brown slightly gravelly clay. Gravels are fine to coarse brick, concrete and sub-angular to rounded flint. Very occasional fine fragments of clinker (MADE GROUND)
			0.70			Soft to firm brown slightly gravelly CLAY. Gravels are fine to coarse sub-angular to rounded flint.
0.75	D		0.79			Soft white gravelly CHALK with frequent fine to coarse sub-angular to rounded flint and occasional cobbles of flint.
						Borehole complete at 0.79m

Remarks:

Groundwater: None encountered

LUSTRE CONSULTING	**Lustre Consulting Ltd**		Borehole No. **BH2**
Project Name: Canterbury Street, Gillingham	Project No. 1000	Co-ords: -	Date: 12/01/10
Project Type: Phase II Site Investigation		Dimensions: -	Scale: NTS
Client: Charing Care Limited			Logged By: SJO

Samples & In Situ Testing			Depth	Level	Legend	Stratum Description
Depth	Type	Results	(m)	(mAOD)		
			0.1			Tarmac and concrete layer
0.2	D		0.5			Black / grey gravelly sand. Gravels are fine to coarse brick, concrete and sub-angular to rounded flint. Very occasional fine fragments of asphalt (MADE GROUND)
			0.55			Layer of flint cobbles
0.6 - 0.8	D		0.95			Firm to stiff orange / brown slightly gravelly CLAY. Gravels are fine to coarse sub-angular to rounded flint.
1.2	D		2.0			Soft to firm white gravelly CHALK with frequent fine to coarse sub-angular to rounded flint and occasional cobbles of flint.
						Borehole complete at 2.0m

Remarks:

Groundwater: None encountered

LUSTRE CONSULTING	**Lustre Consulting Ltd**		Borehole No. **BH3**
Project Name: Canterbury Street, Gillingham	Project No. 1000	Co-ords: -	Date: 12/01/10
Project Type: Phase II Site Investigation		Dimensions: -	Scale: NTS
Client: Charing Care Limited			Logged By: SJO

Samples & In Situ Testing			Depth	Level	Legend	Stratum Description
Depth	Type	Results	(m)	(mAOD)		
			0.15			Tarmac and concrete layer
0.3	D					Brown gravelly sand. Gravels are fine to coarse brick, concrete and sub-angular to rounded flint (MADE GROUND / RUBBLE)
			0.6			
0.7	D					Very stiff orange / brown slightly gravelly CLAY. Gravels are fine to coarse sub-angular to rounded flint.
			0.85			
1.1	D					Firm to stiff white gravelly CHALK with frequent fine to coarse sub-angular to rounded flint and occasional cobbles of flint.
			2.0			
						Borehole complete at 2.0m

Remarks:

Groundwater: None encountered

LUSTRE CONSULTING	**Lustre Consulting Ltd**		Borehole No. **BH4**
Project Name: Canterbury Street, Gillingham	Project No. 1000	Co-ords: -	Date: 12/01/10
Project Type: Phase II Site Investigation		Dimensions: -	Scale: NTS
Client: Charing Care Limited			Logged By: SJO

Samples & In Situ Testing			Depth	Level	Legend	Stratum Description
Depth	Type	Results	(m)	(mAOD)		
			0.2			Concrete layer
0.25	D		0.6			Brown gravelly sand with pockets of black ashy clinker. Gravels are fine to coarse brick, concrete and sub-angular to rounded flint (MADE GROUND / RUBBLE)
0.5-0.6	D		0.65			Very stiff light brown slightly gravelly CLAY. Gravels are fine to coarse sub-angular to rounded flint. Occasional cobbles of flint.
1.0-1.2	D		2.0			Firm to stiff white gravelly CHALK with frequent fine to coarse sub-angular to rounded flint and occasional cobbles of flint.
						Borehole complete at 2.0m

Remarks:

Groundwater: None encountered

LUSTRE CONSULTING	**Lustre Consulting Ltd**		Borehole No. **BH5**
Project Name: Canterbury Street, Gillingham	Project No. 1000	Co-ords: -	Date: 12/01/10
Project Type: Phase II Site Investigation		Dimensions: -	Scale: NTS
Client: Charing Care Limited			Logged By: SJO

Samples & In Situ Testing			Depth	Level	Legend	Stratum Description
Depth	Type	Results	(m)	(mAOD)		
			0.2			Concrete layer
0.4-0.5	D		0.5			Black gravelly sand with pockets of black ashy clinker and yellow brick rubble. Gravels are fine to coarse brick, concrete and flint (MADE GROUND / RUBBLE)
0.8	D		0.6			Very stiff brown slightly gravelly CLAY. Gravels are fine to coarse sub-angular to rounded flint. Occasional cobbles of flint.
1.5	D		2.0			Firm white gravelly CHALK with frequent fine to coarse sub-angular to rounded flint and occasional cobbles of flint.
						Borehole complete at 2.0m

Remarks:

Groundwater: None encountered

APPENDIX B

PHOTOGRAPHIC RECORD

BH1 Arisings

BH1

BH2 arisings showing made ground, natural clay and chalk

BH3 arisings showing made ground, natural clay and chalk

BH4 arisings showing made ground, natural clay and chalk

BH5 arisings showing made ground, natural clay and chalk

APPENDIX C

CHEMICAL TEST CERTIFICATES

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Lustre Consulting
239 Southborough Lane
Bromley
Kent
BR2 8AT

FAO Sarah Oliver
22 January 2010

Dear Sarah Oliver

Test Report Number **98264**
Your Project Reference **Canterbury St - 1001**

Please find enclosed the results of analysis for the samples received 14 January 2010.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Authorised Signatory

□ Darrell Hall	Laboratory Manager
□ Phil Hellier	Operations Director
□ Keith Jones	Technical Development Manager
□ John Crawford	Quality Manager
□ Malcolm Avis	Technical Director

UKAS TESTING
2183

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*

Lustre Consulting
239 Southborough Lane
Bromley
Kent
BR2 8AT

FAO Sarah Oliver

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 14 January 2010

Canterbury St - 1001

Chemtest
The right chemistry to deliver results

Report Date
22 January 2010

Login Batch No					98264							
Chemtest LIMS ID					AE60773	AE60774	AE60775	AE60776	AE60778	AE60780	AE60782	AE60783
Sample ID					BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4
Sample No												
Depth					0.35m	0.75m	0.2m	0.6m - 0.8m	0.3m	1.1m	0.5m - 0.6m	1m - 1.2m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*								
2300	Cyanide (total)	57125	mg kg-¹	M	2.1	0.70	1.1	<0.50	<0.50	<0.50	<0.50	<0.50
2625	Total Organic Carbon		%	M	2.4	0.56	0.67	0.29	1.4	< 0.20	0.29	< 0.20
2120	Boron (hot water soluble)	7440428	mg kg-¹	M	0.7	0.6	0.7	1.2	<0.4	<0.4	0.5	<0.4
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	0.03	0.03	0.05	0.08	0.05	0.04	0.08	0.07
2450	Arsenic	7440382	mg kg-¹	M	24	18	24	15	15	17	12	9.9
	Cadmium	7440439	mg kg-¹	M	0.32	0.39	0.48	0.19	1.5	0.22	0.29	0.14
	Chromium	7440473	mg kg-¹	M	27	27	17	44	9.4	<5.0	17	<5.0
	Copper	7440508	mg kg-¹	M	45	15	12	15	<5.0	<5.0	5.0	<5.0
	Mercury	7439976	mg kg-¹	M	0.57	0.22	0.11	<0.10	<0.10	<0.10	0.10	<0.10
	Nickel	7440020	mg kg-¹	M	28	26	18	36	6.7	<5.0	15	<5.0
	Lead	7439921	mg kg-¹	M	260	48	61	19	46	<5.0	9.1	<5.0
	Selenium	7782492	mg kg-¹	M	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Zinc	7440666	mg kg-¹	M	73	38	74	63	200	<10	19	<10
2670	Total Petroleum Hydrocarbons		mg kg-¹	M	< 10	< 10	26	< 10	450	< 10	< 10	< 10
2700	Naphthalene	91203	mg kg-¹	M	0.18	< 0.1	0.18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-¹	M	0.32	0.17	0.66	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Acenaphthene	83329	mg kg-¹	M	0.3	0.12	0.24	0.19	0.21	< 0.1	< 0.1	< 0.1
	Fluorene	86737	mg kg-¹	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Phenanthrene	85018	mg kg-¹	M	1.1	0.48	4.5	0.26	0.13	< 0.1	0.7	0.22
	Anthracene	120127	mg kg-¹	M	0.36	0.16	0.76	< 0.1	0.12	< 0.1	0.16	< 0.1
	Fluoranthene	206440	mg kg-¹	M	2.1	0.89	9.2	0.56	0.3	< 0.1	1.3	0.46
	Pyrene	129000	mg kg-¹	M	1.6	0.67	5.7	0.46	0.29	< 0.1	0.95	0.32
	Benzo[a]anthracene	56553	mg kg-¹	M	1.1	0.5	4.8	0.36	0.13	< 0.1	0.53	0.22
	Chrysene	218019	mg kg-¹	M	1.4	0.6	6.7	0.38	0.4	< 0.1	0.58	0.26
	Benzo[b]fluoranthene	205992	mg kg-¹	M	1.5	0.64	7.1	0.33	< 0.1	< 0.1	0.51	0.34
	Benzo[k]fluoranthene	207089	mg kg-¹	M	1.7	0.45	6.4	0.33	< 0.1	< 0.1	0.57	0.42
	Benzo[a]pyrene	50328	mg kg-¹	M	1.8	0.5	7.1	< 0.1	< 0.1	< 0.1	0.38	0.22
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	0.1	1.7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	< 0.1	0.21	6.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	< 0.1	< 0.1	6.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Total (of 16) PAHs		mg kg-¹	M	14	5.5	68	3	< 2	< 2	5.7	2.5

All tests undertaken between 14-Jan-2010 and 20-Jan-2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page

Lustre Consulting
239 Southborough Lane
Bromley
Kent
BR2 8AT

FAO Sarah Oliver

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 14 January 2010

Canterbury St - 1001

Chemtest
The right chemistry to deliver results

Report Date
22 January 2010

Login Batch No					98264	
Chemtest LIMS ID					AE60784	AE60786
Sample ID					BH5	BH5
Sample No						
Depth					0.4m - 0.5m	1.5m
Matrix					*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*		
2300	Cyanide (total)	57125	mg kg-¹	M	<0.50	<0.50
2625	Total Organic Carbon		%	M	0.46	< 0.20
2120	Boron (hot water soluble)	7440428	mg kg-¹	M	1.5	<0.4
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	0.20	0.08
2450	Arsenic	7440382	mg kg-¹	M	11	11
	Cadmium	7440439	mg kg-¹	M	0.29	0.19
	Chromium	7440473	mg kg-¹	M	35	<5.0
	Copper	7440508	mg kg-¹	M	14	<5.0
	Mercury	7439976	mg kg-¹	M	0.13	<0.10
	Nickel	7440020	mg kg-¹	M	33	<5.0
	Lead	7439921	mg kg-¹	M	39	<5.0
	Selenium	7782492	mg kg-¹	M	<0.20	<0.20
	Zinc	7440666	mg kg-¹	M	61	<10
2670	Total Petroleum Hydrocarbons		mg kg-¹	M	< 10	< 10
2700	Naphthalene	91203	mg kg-¹	M	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-¹	M	0.1	< 0.1
	Acenaphthene	83329	mg kg-¹	M	< 0.1	< 0.1
	Fluorene	86737	mg kg-¹	M	< 0.1	< 0.1
	Phenanthrene	85018	mg kg-¹	M	0.57	0.11
	Anthracene	120127	mg kg-¹	M	0.14	< 0.1
	Fluoranthene	206440	mg kg-¹	M	0.92	0.19
	Pyrene	129000	mg kg-¹	M	0.67	0.17
	Benzo[a]anthracene	56553	mg kg-¹	M	0.4	0.11
	Chrysene	218019	mg kg-¹	M	0.44	0.11
	Benzo[b]fluoranthene	205992	mg kg-¹	M	0.49	< 0.1
	Benzo[k]fluoranthene	207089	mg kg-¹	M	0.53	0.15
	Benzo[a]pyrene	50328	mg kg-¹	M	0.39	0.15
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	0.13	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	0.28	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	0.36	< 0.1
	Total (of 16) PAHs		mg kg-¹	M	5.5	< 2

All tests undertaken between 14-Jan-2010 and 20-Jan-2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page

Lustre Consulting
239 Southborough Lane
Bromley
Kent
BR2 8AT

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 14 January 2010

Canterbury St - 1001

Report Date
22 January 2010

FAO Sarah Oliver

					98264							
					AE60773	AE60774	AE60775	AE60776	AE60778	AE60780	AE60782	AE60783
					BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4
					0.35m	0.75m	0.2m	0.6m - 0.8m	0.3m	1.1m	0.5m - 0.6m	1m - 1.2m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2920	Phenols (total)		mg kg^{-1}	N	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
2010	pH		-	M	8.1	8.3	9.0	7.6	8.9	8.5	8.7	9.0
2186	Asbestos Containing Material		-	N	not found	not found	not found	not found	not found	not found	not found	not found

All tests undertaken between 14-Jan-2010 and 20-Jan-2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page

Lustre Consulting
239 Southborough Lane
Bromley
Kent
BR2 8AT

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 14 January 2010

Canterbury St - 1001

Report Date
22 January 2010

FAO Sarah Oliver

					98264	
					AE60784	AE60786
					BH5	BH5
					0.4m - 0.5m	1.5m
					SOIL	*SOIL*
2920	Phenols (total)		mg kg-¹	N	<0.3	<0.3
2010	pH		-	M	8.0	8.2
2186	Asbestos Containing Material		-	N	not found	not found

All tests undertaken between 14-Jan-2010 and 20-Jan-2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page

APPENDIX D

RISK ASSESSMENT METHODOLOGY

RISK ASSESSMENT

This chapter assesses the potential for the site to give rise to environmental risks and whether or not the risks are acceptable or if further assessment or remedial action is required.

The qualitative risk assessment firstly considers the source of contamination and potential contaminants associated with the source(s) (or hazards). As well as the type of source, the extent, concentration and availability of a contaminant is also assessed.

The effect of a hazard on an identified receptor is largely governed by the sensitivity of a receptor. Receptors may typically include people, buildings, animals, plants and local resources (such as groundwater, surface waters, mines etc.

A change in the receptor should be considered if the end-use of the site changes, for example, if a commercial site is to be redeveloped into a residential housing estate as a residential occupier is considered more sensitive than a commercial occupier.

The presence of contamination (as a potential hazard) does not necessary mean that there is a risk. It is the exposure pathway and the quantity of contamination that reaches the receptor which may determine the effect on a receptor (such as the integrity of a barrier between a contamination source and receptor).

The risk classifications for both likelihood and consequence is based on methodology presented in Contaminated Land Risk Assessment, A Guide to Good Practice (CIRIA C552, 2001) and has been developed from procedures outlined in DETR Circular 02/2000. The DETR, with the EA and Institute of Environment & Health, has also published guidance on risk assessment (Guidelines for Environmental Risk Assessment and Management). The guidance states that the designation of risk is based upon a consideration of both:

- The magnitude of the potential consequence (severity) of risk occurring which takes into account both the potential severity of the hazard and the sensitivity of the receptor; and

- The likelihood of an event occurring (probability) which takes into account the both the presence of the hazard and receptor and the integrity of the pathway.

The magnitude of consequence (severity) and likelihood (probability) is defined in the CIRIA guidance, together with examples. The two classifications are then compared (as shown on Table 1) to obtain an estimation of risk for each pollution linkage, ranging from “very high risk” to “very low risk”. A description of the risks and likely actions required is presented in Table 2. The benefit of estimating the risk in this way is that it can be revised after each investigation phase as the conceptual model and corresponding pollution linkages are refined.

Table 1: Comparison of Consequence Against probability

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Likelihood	**High likelihood**	Very high risk	High risk	Moderate risk	Moderate/ low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/ low risk	Low risk	Very low risk	Very low Risk

Table 2: Description of the Classified Risks and Likely Action Required

Level of Risk	Description of Classification
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. If this risk is realised, it is likely to result in significant environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation (if not already undertaken) and remediation is likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. If risk is realised, it is likely to present a sizeable environmental and financial liability to current and/ or future site owners/ occupiers. Urgent investigation is required and remediation work may be necessary in the short term and likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the potential environmental liability. Some remedial works may be required over the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild. Limited investigation may be recommended to clarify the risk, dependant on the sensitivity of the receptor and view point of those of interest. Any remedial works are likely to be fairly limited.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is likely to be mild or minor.

The acceptability of risk will always depend upon the view point of those of interest, whether it is an occupier of a site, a regulator or stakeholder. As a result, it could be that action will be required to deal with a level of risk even if it is classified as very low.

APPENDIX E

NOTES ON LIMITATIONS

LUSTRE CONSULTING, ENVIRONMENTAL AND GEOTECHNICAL CONSULTANCY SERVICES

NOTES ON LIMITATIONS

General

Lustre Consulting have completed the attached report for the use of the Client detailed on the front cover and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed.

Third parties should not use or rely upon the contents of the report unless written approval has been gained from Lustre Consulting; (due to legal requirements, a charge may be levied against such approval).

Lustre Consulting accepts no responsibility or liability for:

a) the consequences of this documentation being used for any purpose or project other than that for which it was commissioned, and

b) this document to any third party with whom approval for use has not been agreed.

Phase I Environmental Risk Assessments, Desk Studies and Site Audits

The work completed and utilised to provide this report comprises a study of available documentation. The opinions and results presented in this report have been arrived at by utilising the finite amount of data available at the time of writing and are relevant only to the purpose for which the report was commissioned. The data which has been reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative information pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, Lustre Consulting reserves the right to review this information and, if warranted, to modify the opinions presented in the report accordingly.

It should be noted that the risks which are identified in this report are perceived risks based on the available information at the time of writing and that the actual risks associated can only be assessed following a physical investigation of the site.

Phase II Site Investigations

The intrusive investigation has been completed to provide information concerning the type and degree of contamination present along with ground and groundwater conditions which facilitates a reasonable risk assessment to be completed. The stated objectives of the ground investigation have been limited to assessing the proven risks which are associated with potential human targets, building materials, the environment (including adjacent land), and to surface and groundwater.

The amount of exploratory work, chemical testing and monitoring completed as part of this project has potentially been restricted by the short timescale available, and the locations of exploratory holes undertaken have potentially been restricted to areas unoccupied by buildings(s) and buried services. A more comprehensive post demolition / decommission investigation may be required if the site is to be redeveloped. For these reasons any costs included in relation to site remediation must be considered as tentative only at this time.

The exploratory holes investigate only a small volume of the ground in relation to the size of the site and therefore, can only provide a “snap shot” or general indication of ground conditions located on the site. The fact that the site has been investigated does not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

The risk assessment and opinions provided in this report take into account currently available guidance values relating to acceptable contamination concentrates; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.